

How to Cite:

Babu, K. R., Vijayaraman, M., Shastri, D., & Manivannan, E. (2022). Study of biochemical and sperm parameters in infertile males with diabetes mellitus . *International Journal of Health Sciences*, 6(S7), 1577–1583. <https://doi.org/10.53730/ijhs.v6nS7.11438>

Study of biochemical and sperm parameters in infertile males with diabetes mellitus

K. Ranjith Babu*

Ph.D. Scholar, Vinayaka Mission's Research Foundation, Salem, Tamilnadu, India, Mobile: 9912302200.

*Corresponding Author, email Id: drranjithbabu@gmail.com

Dr. Manibalan Vijayaraman

Associate Professor of Physiology, Vinayaka Mission's Medical College, Karaikal, Tamilnadu, India.

Dr. Deepti Shastri

Professor of Anatomy, Vinayaka Mission's Kirupananda Variyar Medical College, Salem, Tamilnadu, India.

Dr. E.Manivannan

Professor of Pharmacology, Vinayaka Mission's Kirupananda Variyar Medical College, Salem, Tamilnadu, India.

Abstract--World Health Organization has stated Infertility as a medical condition in which an individual has the inability to conceive even after one year of regular unprotected active sexual intercourse. Presently, Infertility has been a major condition, which is multifactorial in nature and is supposed to have been affected approximately about 15% to 20% of the couples who are desperate for pregnancy. The contributory factors for male infertility may be of different factors comprising of complex pathogenesis, change in lifestyle, other organic diseases, genetic factors, environmental risk factors and their interactions. The patients with subnormal semen parameters are advised for blood hormonal analysis tests as these hormonal tests are more reliable and valid in the further proper management of the infertility [11]. These hormonal tests include Follicle Stimulation Hormone (FSH), Testosterone, Luteinizing Hormone (LH), Prolactin. This cross section study was done in 100 males, 50 diabetic infertile men and 50 non-diabetic fertile men. Semen samples were obtained by masturbation after 2–7 days of sexual abstinence. The Semen Samples were analyzed as per the instructions given in the WHO manual for semen analysis. A blood sample was withdrawn from a cubital vein of each participant, centrifuged, and the serum was separated and frozen. All samples

were analyzed for the levels of FBS, FSH, LH, Prolactin and Testosterone by Chemiluminescence Immunoassay (CLIA) using Beckmen Coulter analyzer Access-2 auto-analyzer. The results were arranged in suitable tables for analysis under the relevant headings as (mean \pm standard deviation) for each parameter subgroups separately. Statistical analysis was done using IBM SPSS Statistics 20 package. P value <0.05 was considered as statistically significant and p-value of <0.005 was considered as statistically highly significant. Levels of FBS, FSH, LH, Prolactin were found to increased and Testosterone levels were found to be lowered in the diabetic infertile study group when compared to non-diabetic fertile control group.

Keywords--Diabetic infertile, nondiabetic fertile, biochemical, semen analysis, FSH, LH, FBS, Prolactin, Testosterone

Introduction

World Health Organization has stated Infertility as a medical condition in which an individual has the inability to conceive even after one year of regular unprotected active sexual intercourse. Presently, Infertility has been a major condition, which is multifactorial in nature and is supposed to have been affected approximately about 15% to 20% of the couples who are desperate for pregnancy [1-4]. Infertility is more concerned as it may result in mental agony and psychological disturbances, which may result to a severity of suicide also. For the same reason the couples visiting hospitals have to be managed with utmost care and proper counselling has to be included in managing such patients. Among the total occurrence of infertility, 40% to 50% of factors are related to males, such as defect in sperms or semen quality or both [5-6]. The contributory factors for male infertility may be of different factors comprising of complex pathogenesis, change in lifestyle, other organic diseases, genetic factors, environmental risk factors and their interactions [7-9].

A detailed systematic investigation including history, examination, and investigative protocol is mandatory for optimal management of infertility. During evaluation, sperm analysis comprising microscopic and macroscopic examination of the semen is of high significance. Special investigations for endocrine dysfunction also have to be done for further proper management of the infertility. Semen analysis is the key and preliminary mandatory assessment of the male partner in the management of infertility. WHO has published a manual describing the details of normal parameters of normal semen and also it has extensively described the procedures involved in proper analysis of semen in the laboratories [10].

The patients with subnormal semen parameters are advised for blood hormonal analysis tests as these hormonal tests are more reliable and valid in the further proper management of the infertility [11]. These hormonal tests include Follicle Stimulation Hormone (FSH), Testosterone, Luteinizing Hormone (LH), Prolactin [12-15].

Materials and Methods

This cross section study was done in 100 males, 50 diabetic infertile men (50%) and 50 non-diabetic fertile men (50%). After obtaining Institutional Ethical Committee approval for the study, men attending Department of General Medicine, Dr.Patnam Mahender Reddy Institute of Medical Sciences, Hyderabad, Telangana during January 2020 to December 2021 have been selected as per the inclusion and exclusion criteria with complete medical and clinical histories. Diabetic infertile men and non-diabetic fertile men with age between 25 to 45 years are selected after obtaining an inform consent. Men with varicocele, smoker, taking exogenous testosterone or any other hormonal drugs, Anti-hypertensives, supplements or non-prescribed medications such as anabolic steroids, having retrograde ejaculation were excluded from this study.

Semen samples were obtained by masturbation after 2–7 days of sexual abstinence. Entire ejaculate is collected in one container which is properly labelled. Care is taken to collect complete ejaculate. Written and verbal instructions were given to the patients to follow the procedure. The Semen Samples were analyzed as per the instructions given in the WHO manual for semen analysis [10]. A blood sample was withdrawn from a cubital vein of each participant, centrifuged, and the serum was separated and frozen. All samples were analyzed at Central Laboratory, Dr.Patnam Mahender Reddy Institute of Medical Sciences. Serum samples were measured for the levels of FBS, FSH, LH, Prolactin and Testosterone by Chemiluminescence Immunoassay (CLIA) using Beckmen Coulter analyzer Access-2 auto-analyzer [16–20]. Control materials were used in conjunction to patients' samples in every analytical runs.

The results were arranged in suitable tables for analysis under the relevant headings. The results were averaged as (mean \pm standard deviation) for each parameter subgroups separately. Each variable, including Semen Analysis, FBS, FSH, LH, Testosterone and Prolactin were analysed by Paired Sample t-test. Statistical analysis was done using IBM SPSS Statistics 20 package. P value <0.05 was considered as statistically significant and p-value of <0.005 was considered as statistically highly significant.

Results

The mean sperm concentration in infertile males (12.56 ± 1.60) was found to be low when compared to fertile control group (14.20 ± 1.80) which is a significant finding. Among the analysis of the data, the values having mean t-test with p value of (<0.05) was considered to be significant. In the study, it is found that the sperm concentration is directly related to the fertility with high value of normal counts when compared to the infertile group with lower counts so that we can easily confirm that the sperm concentration based on the observational statistical analysis data in the study (Table-1 & 2).

Observation of the findings in diabetic infertile males showed that there was a significant decrease in Sperm count (30.48 ± 5.43 ; normal: 38.46 ± 7.05); Sperm motility (29.68 ± 7.31 ; normal: 39.74 ± 7.71); Sperm morphology (3.10 ± 0.70 ; normal:

3.74±0.44). The analysis confirms that there is a significant decrease in the normal Sperm morphology, count and motility of the infertile group when compared to normal non-diabetic fertile males (Table. 1 & 2). The p values of the means t-test was of $p < 0.05$.

| | Paired Differences | | | | | t | df | Sig. (2-tailed) |
|---------------------------------------|--------------------|----------------|-----------------|---|---------|---------|----|-----------------|
| | Mean | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference | | | | |
| | | | | Lower | Upper | | | |
| Sperm concentration (Control - Study) | 1.640 | 2.087 | .295 | 1.047 | 2.233 | 5.555 | 49 | .000 |
| Sperm count (Control - Study) | 7.980 | 8.861 | 1.253 | 5.462 | 10.498 | 6.368 | 49 | .000 |
| Sperm motility (Control - Study) | 10.060 | 12.116 | 1.713 | 6.617 | 13.503 | 5.871 | 49 | .000 |
| Sperm morphology (Control - Study) | .640 | .749 | .106 | .427 | .853 | 6.039 | 49 | .000 |
| FBS (Control - Study) | -65.120 | 49.859 | 7.051 | -79.290 | -50.950 | -9.235 | 49 | .000 |
| FSH (Control - Study) | -10.320 | 7.138 | 1.010 | -12.349 | -8.291 | -10.223 | 49 | .000 |
| LH (Control - Study) | -5.760 | 3.261 | .461 | -6.687 | -4.833 | -12.489 | 49 | .000 |
| Testosterone (Control - Study) | 3.280 | 2.339 | .331 | 2.615 | 3.945 | 9.916 | 49 | .000 |
| Prolactin (Control - Study) | -8.200 | 5.518 | .780 | -9.768 | -6.632 | -10.508 | 49 | .000 |

Table 1: Paired Samples Test between Non-Diabetic Fertile men and Diabetic Infertile men

| | Mean | N | Std. Deviation | Std. Error Mean |
|-------------------------------|-------|----|----------------|-----------------|
| Sperm concentration (Control) | 14.20 | 50 | 1.807 | .256 |
| Sperm concentration (Study) | 12.56 | 50 | 1.606 | .227 |
| Sperm count (Control) | 38.46 | 50 | 7.054 | .998 |
| Sperm count (Study) | 30.48 | 50 | 5.433 | .768 |
| Sperm motility (Control) | 39.74 | 50 | 7.719 | 1.092 |
| Sperm motility (Study) | 29.68 | 50 | 7.314 | 1.034 |
| Sperm morphology (Control) | 3.74 | 50 | .443 | .063 |
| Sperm morphology (Study) | 3.10 | 50 | .707 | .100 |

| | | | | |
|------------------------|--------|----|--------|-------|
| FBS (Control) | 90.44 | 50 | 8.345 | 1.180 |
| FBS (Study) | 155.56 | 50 | 49.584 | 7.012 |
| FSH (Control) | 10.10 | 50 | 4.273 | .604 |
| FSH (Study) | 20.42 | 50 | 5.399 | .763 |
| LH (Control) | 4.96 | 50 | 2.030 | .287 |
| LH (Study) | 10.72 | 50 | 2.483 | .351 |
| Testosterone (Control) | 4.98 | 50 | 2.152 | .304 |
| Testosterone (Study) | 1.70 | 50 | .863 | .122 |
| Prolactin (Control) | 9.78 | 50 | 4.254 | .602 |
| Prolactin (Study) | 17.98 | 50 | 4.967 | .702 |

Table 2: Paired Samples Statistics between Non-Diabetic Fertile men and Diabetic Infertile men

The Biochemical parameters such as FBS, FSH, LH, Prolactin and Testosterone are the major contribution of this study. The results of FBS, FSH, LH, Prolactin and Testosterone levels in infertile and control (proven non-diabetic fertile men) groups are analysed (Table 1). It is found that the serum levels of FBS (155.56 ± 49.58 ; control value: 90.44 ± 8.34), FSH (20.42 ± 5.39 ; control: 10.10 ± 4.27), LH (10.72 ± 2.48 ; control: 4.96 ± 2.03) and Prolactin levels (17.98 ± 4.96 ; control: 9.78 ± 4.25) were significantly elevated in infertile males when compared with fertile males (control). Serum Testosterone levels were found to be significantly reduced in diabetic infertile males when compared with non-diabetic fertile males (control).

| | N | Correlation | Sig. |
|---------------------------------------|----|-------------|------|
| Sperm concentration (Control & Study) | 50 | .256 | .073 |
| Sperm count (Control & Study) | 50 | .010 | .945 |
| Sperm motility (Control & Study) | 50 | -.299 | .035 |
| Sperm morphology (Control & Study) | 50 | .215 | .134 |
| FBS (Control & Study) | 50 | .051 | .724 |
| FSH (Control & Study) | 50 | -.077 | .595 |
| LH (Control & Study) | 50 | -.035 | .811 |
| Testosterone (Control & Study) | 50 | -.025 | .862 |
| Prolactin (Control & Study) | 50 | .291 | .040 |

Table 3: Paired Samples Correlations between Non-Diabetic Fertile men and Diabetic Infertile men

Discussion

This study was done in 50 diabetic infertile males as study group and 50 diabetic fertile males as control group. Raised levels of serum FSH is also reported by other authors [21-23, 24, 25], which showed elevated levels of both FSH and LH in infertile males. Elevated levels of LH in oligozoospermia and azoospermia males

when compared to normal fertile men were also reported in similar studies [26,23]. The differences in the mean serum testosterone levels between fertile and infertile men were significant. Similar observations were made by other authors also [24,25]. FSH, LH, and testosterone are prime regulators of germ cell development. The quantitative production of spermatozoa generally requires the presence of FSH, LH and testosterone. FSH acts directly on the seminiferous tubules whereas LH stimulates spermatogenesis indirectly via testosterone. FSH also plays a key role in stimulating mitotic and meiotic DNA synthesis in spermatogonia [27]. This study found significantly lower total sperm counts and sperm morphologies, which contradicted with lower free testosterone level and high FSH levels which were significant.

References

1. Oliva A, Spira A, Multigner L. Contribution of environmental factors to the risk of male infertility. *Hum Reprod* 2001;16:1768–76.
2. Gava MM, Chagas Ede O, Bianco B, et al. Methylenetetrahydrofolate reductase polymorphisms are related to male infertility in Brazilian men. *Genet Test Mol Biomarkers* 2011;15:153–7.
3. Lee HD, Lee HS, Park SH, et al. Causes and classification of male infertility in Korea. *Clin Exp Reprod Med* 2012;39:172–5.
4. K. Ranjith Babu, Dr. Manibalan Vijayaraman, Dr. Deepti Shastri, Dr. E. Manivannan. Association of MTFHR polymorphism and male infertility – A review on meta analysis. *IJMACR* Nov-Dec 2021; 4(6): 135-141.
5. Hirsh A. Male subfertility. *BMJ* 2003;327:669–72.
6. Brugh VM, Lipshultz LI. Male factor infertility: Evaluation and management. *Med Clin North Am* 2004;88:367–85.
7. Kupis L, Dobronski PA, Radziszewski P. Varicocele as a source of male infertility-current treatment techniques. *Cent European J Urol* 2015;68:365–70.
8. Miyamoto T, Tsujimura A, Miyagawa Y, et al. Male infertility and its causes in human. *Adv Urol* 2012;2012:384520.
9. Anawalt BD. Approach to male infertility and induction of spermatogenesis. *J Clin Endocrinol Metab* 2013;98:3532–42.
10. WHO laboratory manual for the examination and processing of human semen, Sixth edition. WHO 2021. Available at: <https://www.who.int/publications/i/item/9789240030787>. Accessed October 2021.
11. Zabul J, Mierzejewski W, Rogoza A. Usefulness of examining gonadotropin hormones and testosterone in men with abnormal semen. *Ginekol Pol* 1994;65(2):71-4.
12. Hopkinson CR, Mause J, Schenk B, Flitze E, Hauser CH. Some interrelationship between plasma levels of LH, FSH, oestradiol-17B, androgens and semen analysis data in male infertility patients. *Andrologia* 1977;9:216.
13. De Kretser DM. Elevated levels of serum FSH and LH with increasing severity of seminiferous epithelial damage. *Clin Obstet Gynaecol* 1974;1:409-27.
14. Al-Hakeim HK, Jebur IM, Alkhafaji RS. Serum anti-zona pellucida antibodies level is correlated with estradiol level in women with in vitro fertilization failure. *Int J Pharm Pharm Sci* 2016;8(5):41-4.

15. Sardjono RK, Pradipta V, Musthapa I. The effect of Indonesian velvet bean extract on the fertility of albino male mice. *Int J Pharm Pharm Sci* 2016;8(8):103-6.
16. https://www.beckmancoulter.com/download/file/phxA18496AR-EN_US/A18496AR? type=pdf
17. https://www.beckmancoulter.com/download/file/phxA83734N-EN_US/A83734N? type=pdf
18. https://www.beckmancoulter.com/download/file/phxA83753M-EN_US/A83753M? type=pdf
19. https://www.beckmancoulter.com/download/file/phxA83772L-EN_US/A83772L? type=pdf
20. https://www.beckmancoulter.com/download/file/phxA33261U-EN_US/A33261U? type=pdf
21. Sultan C, Craste de Paulet B, Audran F, Iqbal Y, Ville C. Hormonal evaluation in male infertility. *Ann Biol Clin (Paris)* 1985;43(1):63-6.
22. Hopkinson CR, Mauses J, Schenk B, Flitze E, Hauser CH. Some interrelationship between plasma levels of LH, FSH, oestradiol-17B, androgens and semen analysis data in male infertility patients. *Andrologia* 1977;9:216.
23. De Kretser DM. Elevated levels of serum FSH and LH with increasing severity of seminiferous epithelial damage. *Clin Obstet Gynaecol* 1974;1:409-27.
24. Weinbauer GF, Nieschlag E. Gonadotropin control of testicular germ cell development. *Adv Exp Med Biol* 1995;317:55-65.
25. Subhan F, Tahir F, Ahmad R, Khan ZD. Oligospermia and its relation with hormonal profile. *J Pak Med Assoc* 1995;45(9):246-7.
26. Zabul J, Mierzejewski W, Rogoza A. Usefulness of examining gonadotropin hormones and testosterone in men with abnormal semen. *Ginekol Pol* 1994;65(2):71-4.
27. Anderson RA, Wallace EM, Groome NP, Bellis AJ, Wu FC. Physiological relationships between inhibin B, follicle stimulating hormone secretion and spermatogenesis in normal men and response to gonadotrophin suppression by exogenous testosterone. *Hum Reprod* 1997;12:746-7.
28. Suryasa, I. W., Rodríguez-Gómez, M., & Koldoris, T. (2021). Get vaccinated when it is your turn and follow the local guidelines. *International Journal of Health Sciences*, 5(3), x-xv. <https://doi.org/10.53730/ijhs.v5n3.2938>